

CLEAN ENERGY OUTLOOK: RENEWABLES INVESTMENT BEYOND RPS

GOVERNOR'S ENERGY DEVELOPMENT SUMMIT

ROB GLEN

SALT LAKE CITY, JANUARY 2013



Bloomberg
NEW ENERGY FINANCE

BLOOMBERG NEW ENERGY FINANCE: FOUNDED IN 2004; 180+ STAFF IN 13 OFFICES WORLDWIDE

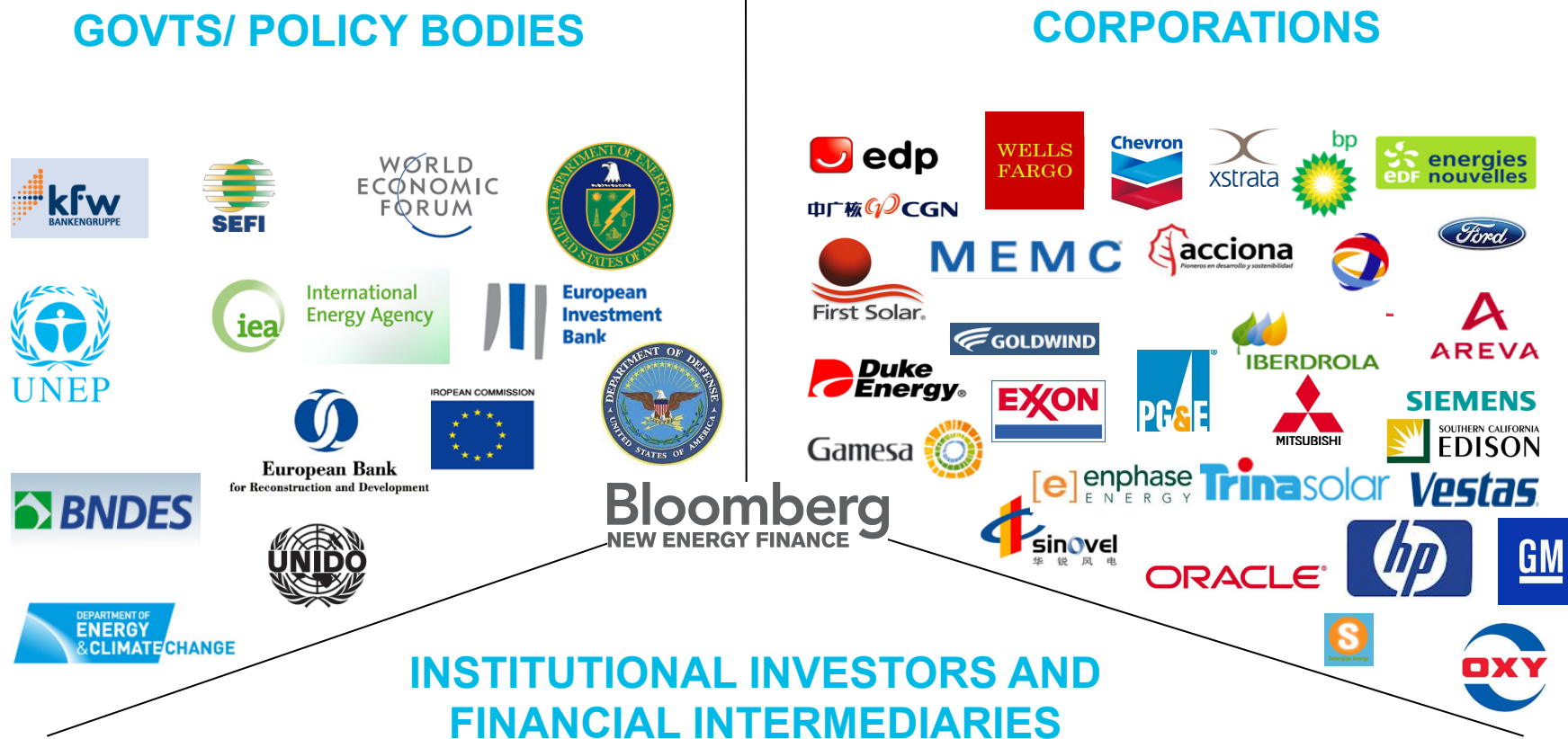
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COMPREHENSIVE, GLOBAL INDUSTRY COVERAGE

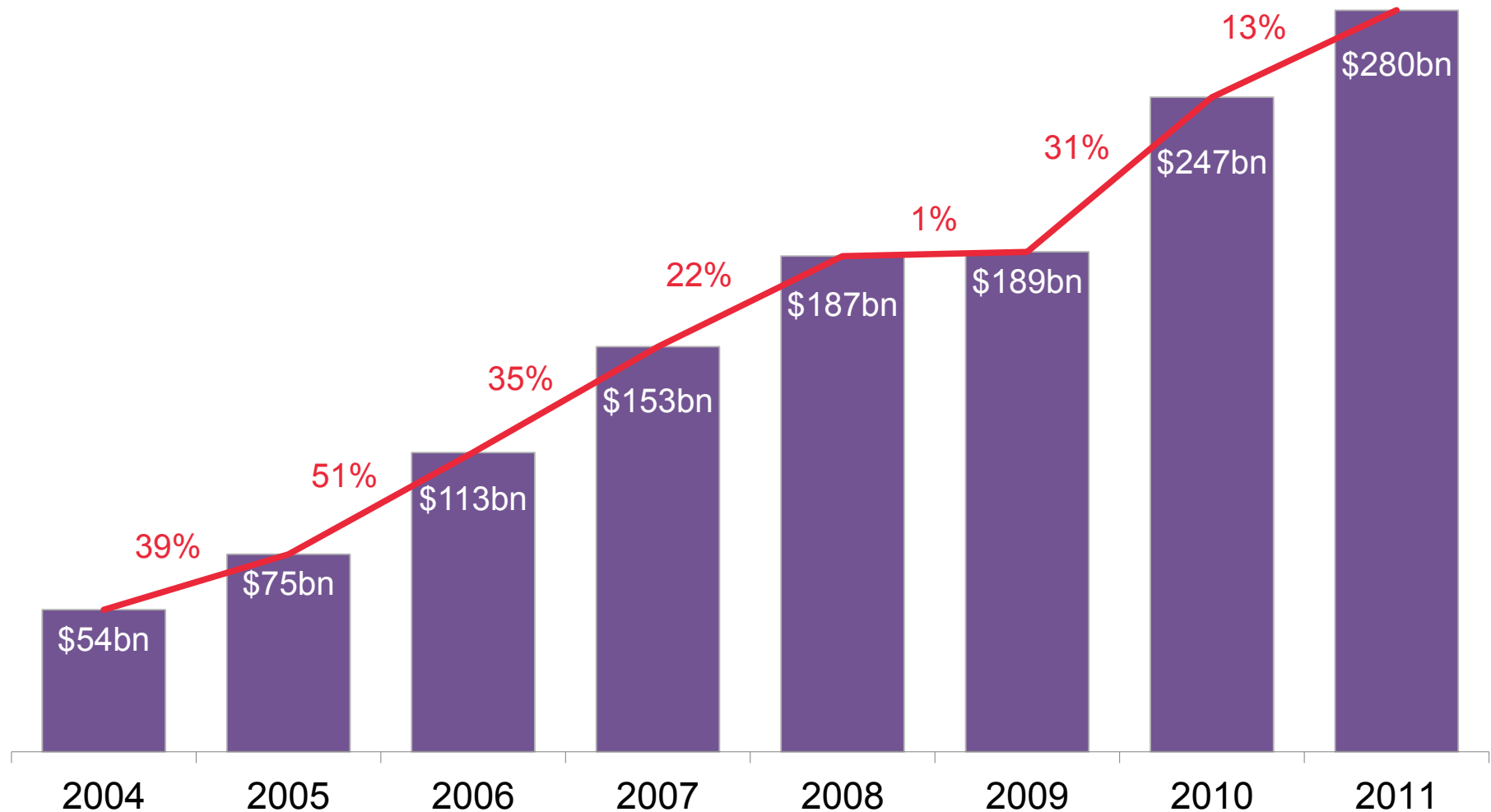
	RENEWABLE ENERGY						CARBON MARKETS				ENERGY SMART TECHNOLOGIES									
INSIGHT <ul style="list-style-type: none">• RESEARCH NOTES• ANALYST REACTIONS• QUARTERLY OUTLOOKS• CONFERENCE CALLS• SECTOR-SPECIFIC DATA	Wind	Solar	Geothermal	Bioenergy	Hydro & marine	Renewable energy credits	North America	EU-ETS	Global / Kyoto	Australia	Energy efficiency	Digital energy (smart grid)	Power storage	Advanced transportation	POWER (EUROPEAN)	GAS	CARBON CAPTURE & STORAGE	NUCLEAR	WATER	
	Cross-sector research (eg, policy analyses, levelised cost of energy updates, regional market outlooks)																			
INDUSTRY INTELLIGENCE	Organisations, projects and deal database, daily news per region																			
NEWS & BRIEFING	Daily news & monthly briefing																			
EVENTS & CONSULTING	BNEF Summit / Food for Thought events / Leadership Forum events Applied research / Data mining / White papers																			

OUR CLIENTS: A CROSS-SECTION OF STAKEHOLDERS



GLOBAL NEW INVESTMENT IN CLEAN ENERGY

2004–11 (\$BN)

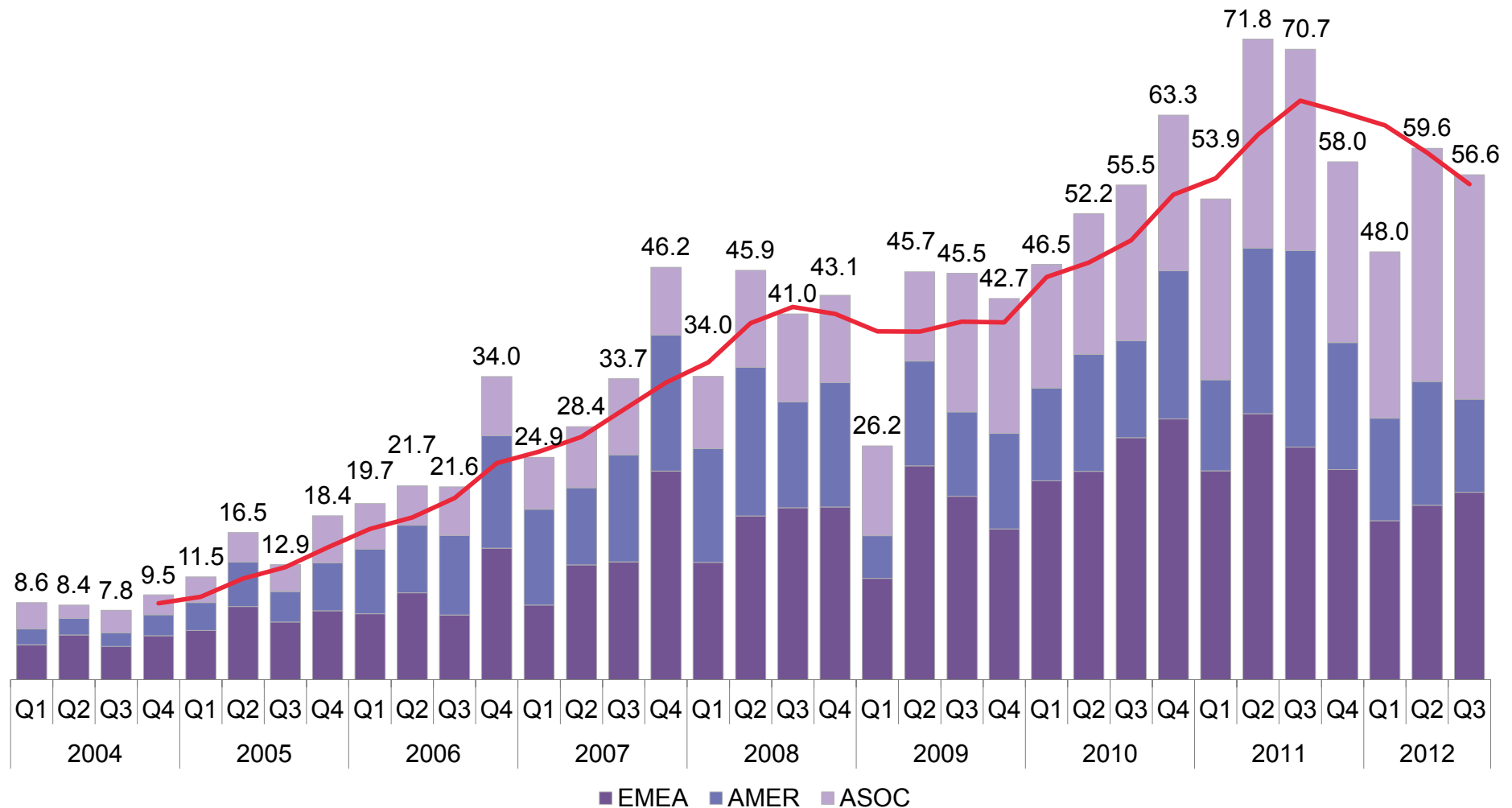


Note: Includes corporate and government R&D, and small distributed capacity. Adjusted for re-invested equity. Does not include proceeds from acquisition transactions.

Source: Bloomberg New Energy Finance

NEW INVESTMENT IN CLEAN ENERGY BY REGION

Q1 2004–Q3 2012 (\$BN)

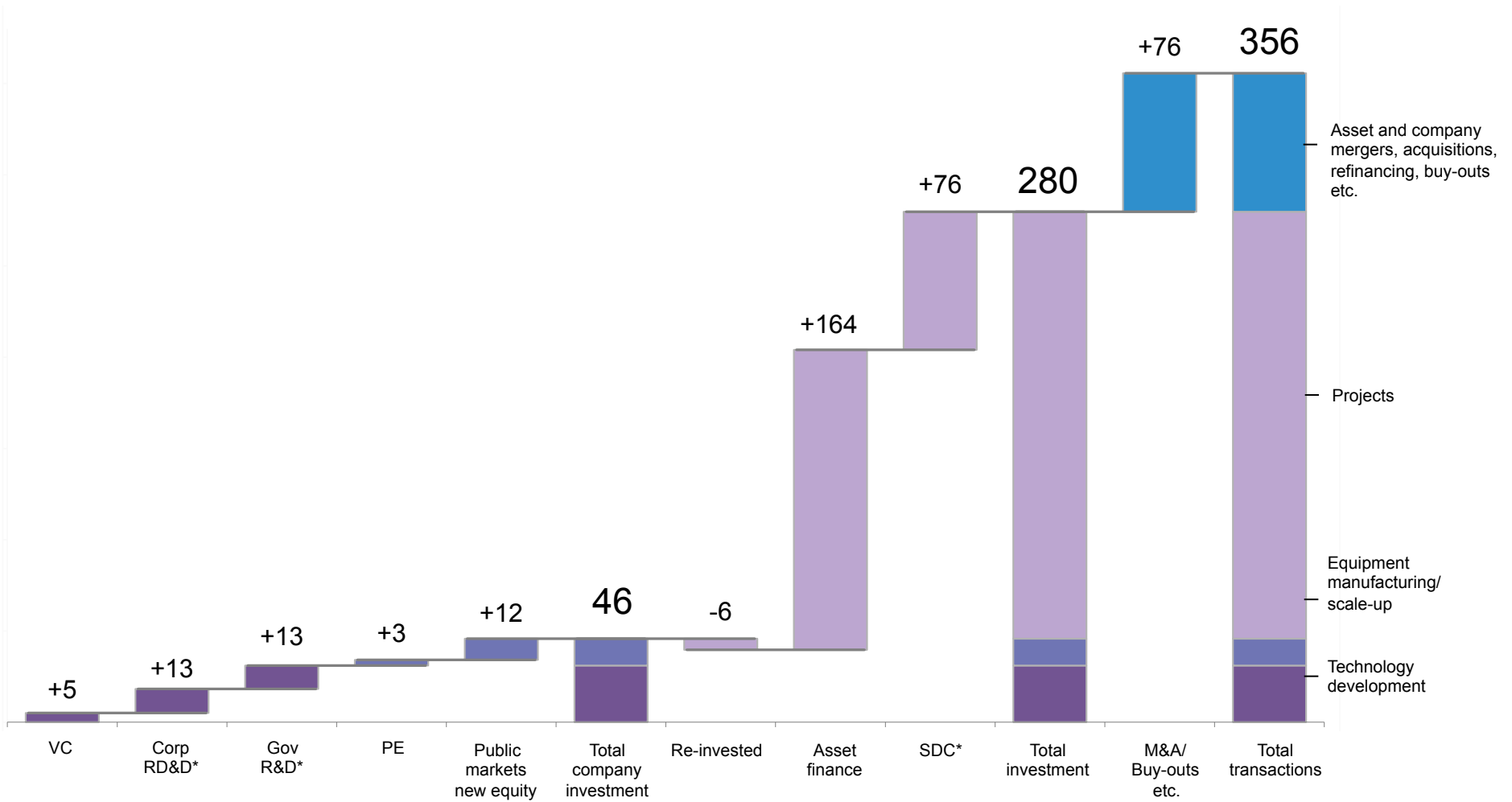


Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D.
Includes small distributed capacity & adjustment for re-invested equity.

Source: Bloomberg New Energy Finance

NEW INVESTMENT IN CLEAN ENERGY IN 2011 - GLOBAL

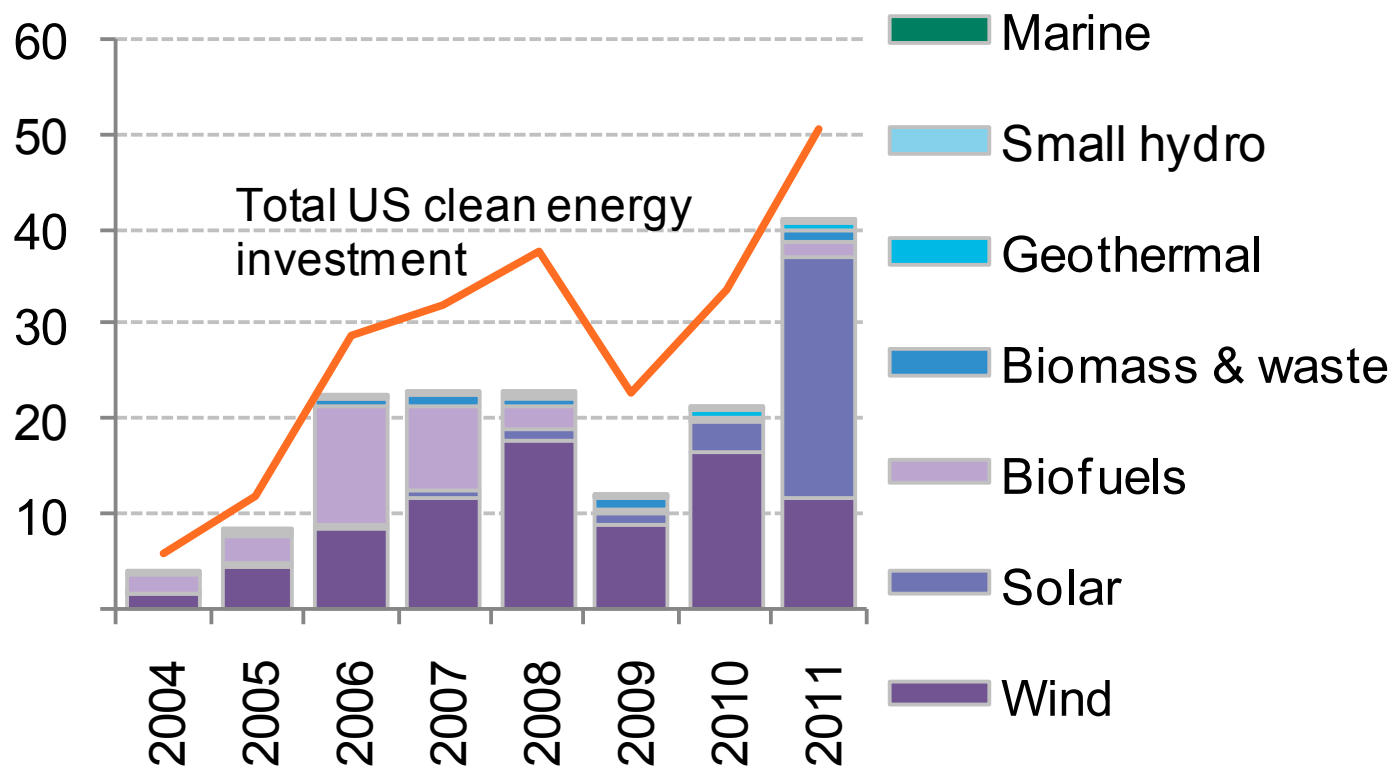
TYPES & FLOWS (\$BN)



Note: Includes corporate and government R&D, and small distributed capacity. Adjusted for re-invested equity.

Source: Bloomberg New Energy Finance

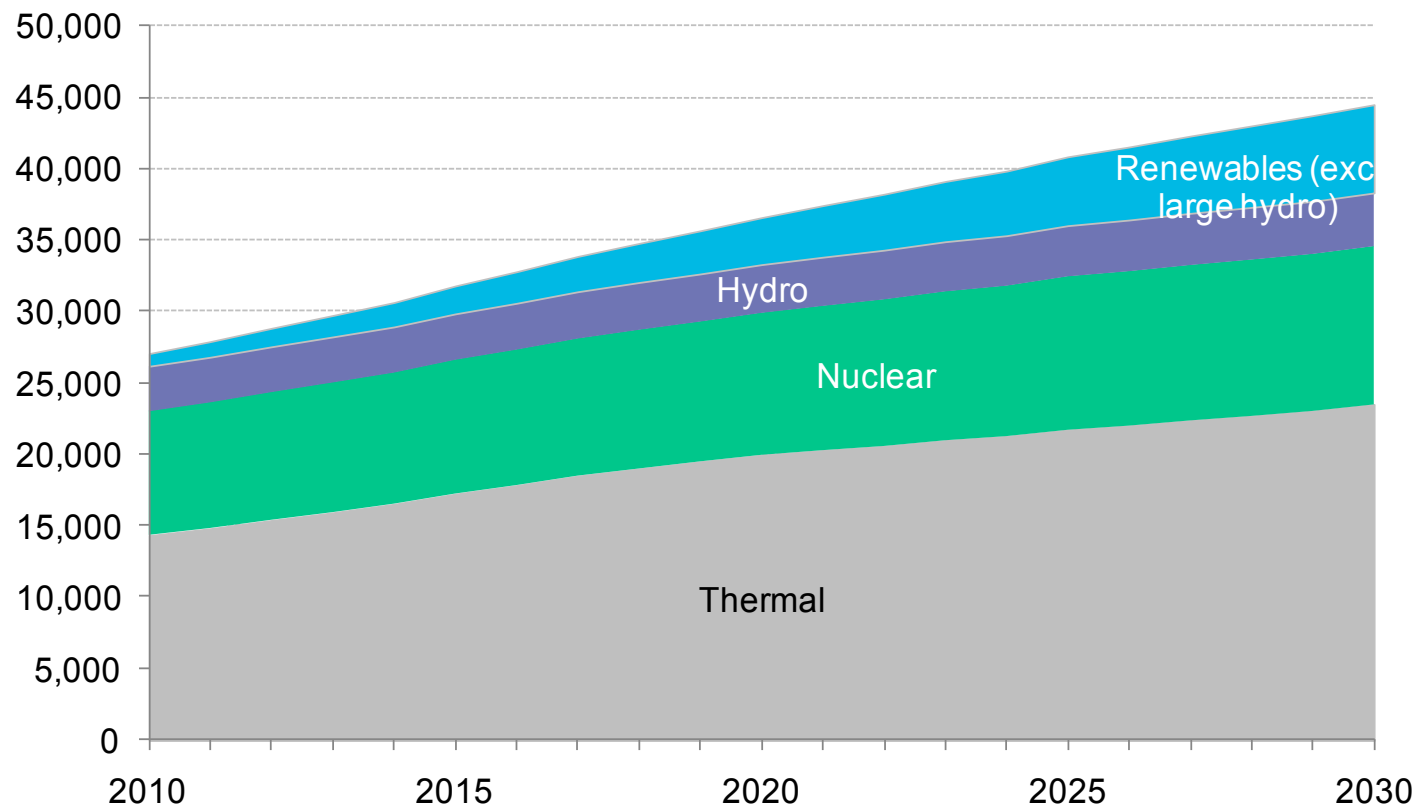
US ASSET FINANCE BY SECTOR, 2004-2011 (\$BN)



Source: Bloomberg New Energy Finance

NET POWER GENERATION BY SOURCE

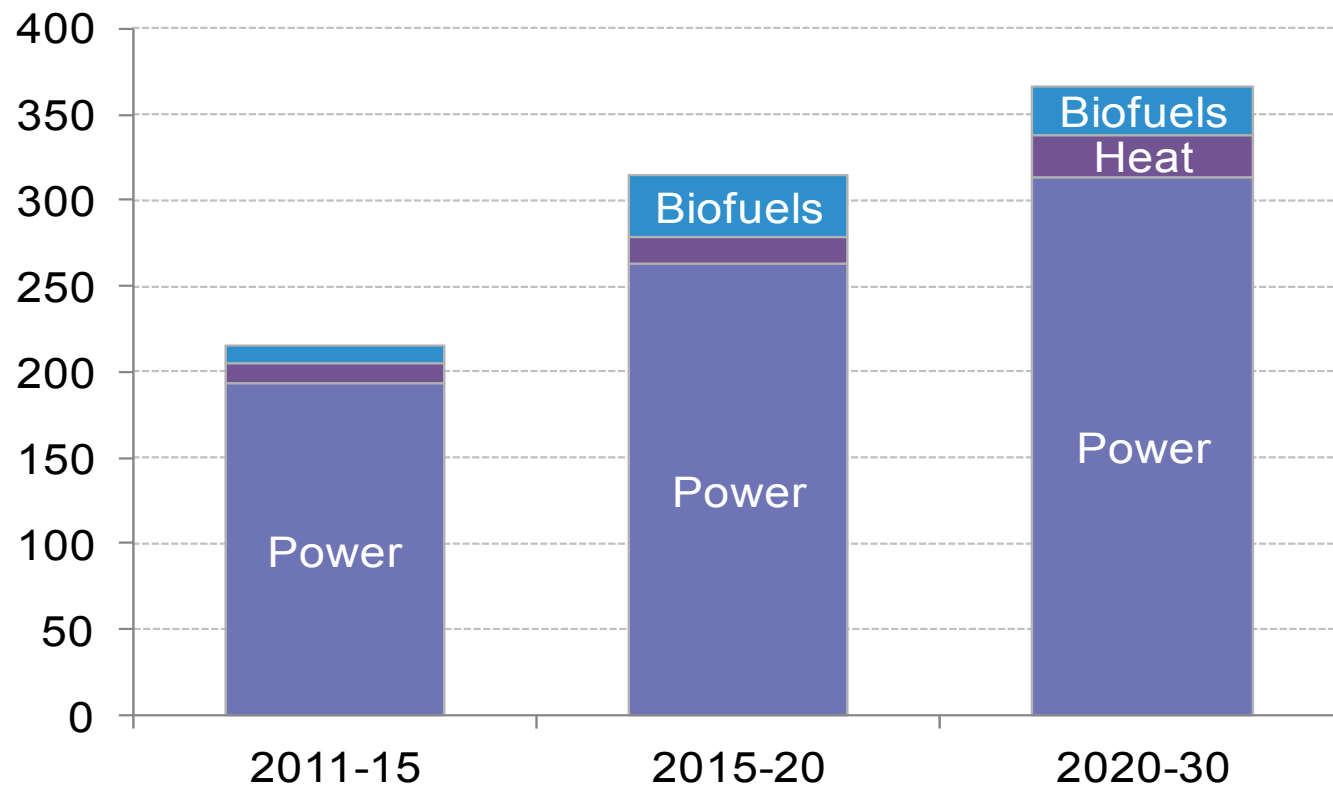
2010-30 (TWH)



Source: Bloomberg New Energy Finance

AVERAGE ANNUAL INVESTMENT IN RENEWABLE ENERGY BY SEGMENT (\$BN)

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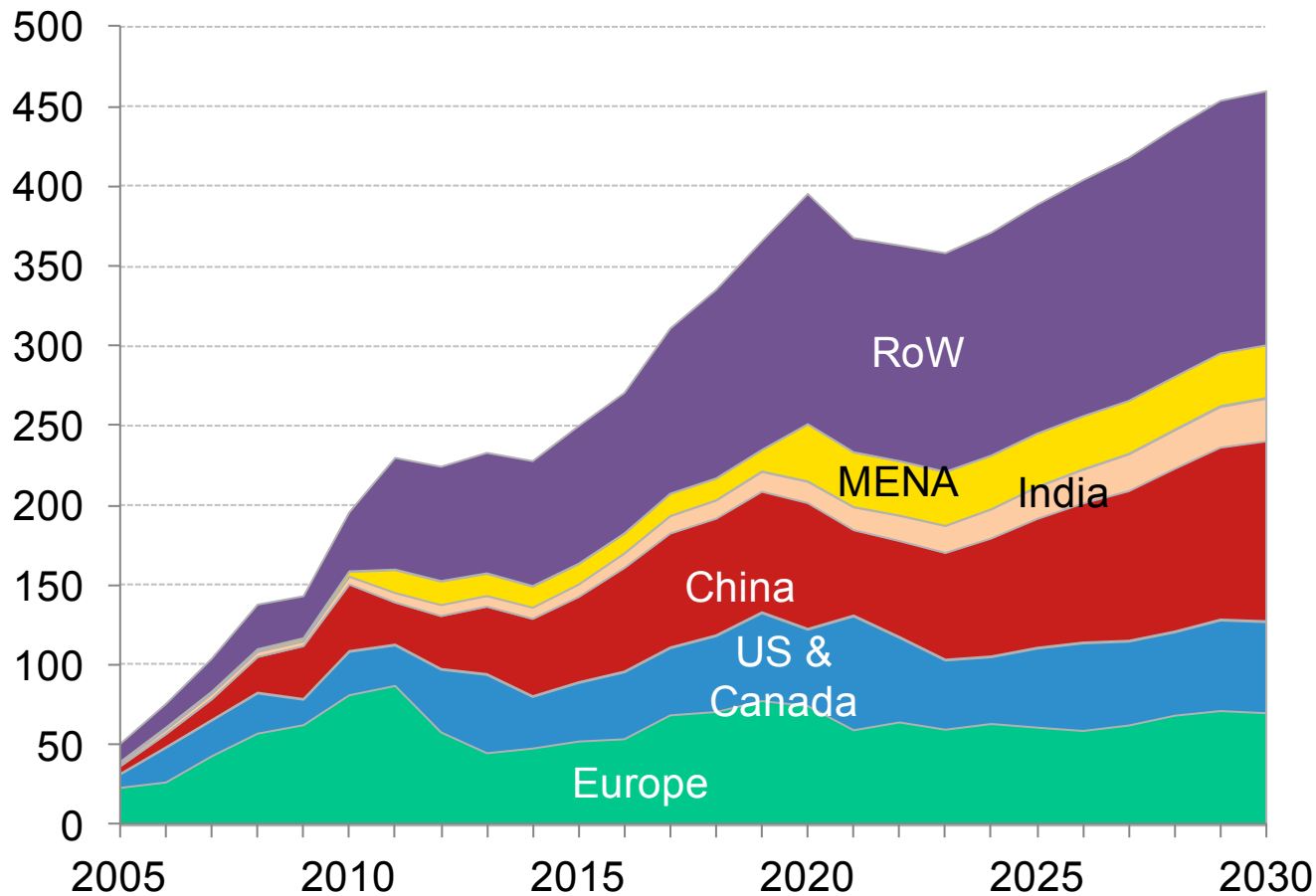


Source: Bloomberg New Energy Finance

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ANNUAL VALUE OF RENEWABLE ENERGY CAPACITY INSTALLED BY GLOBAL REGION, 2005-30 (\$BN)

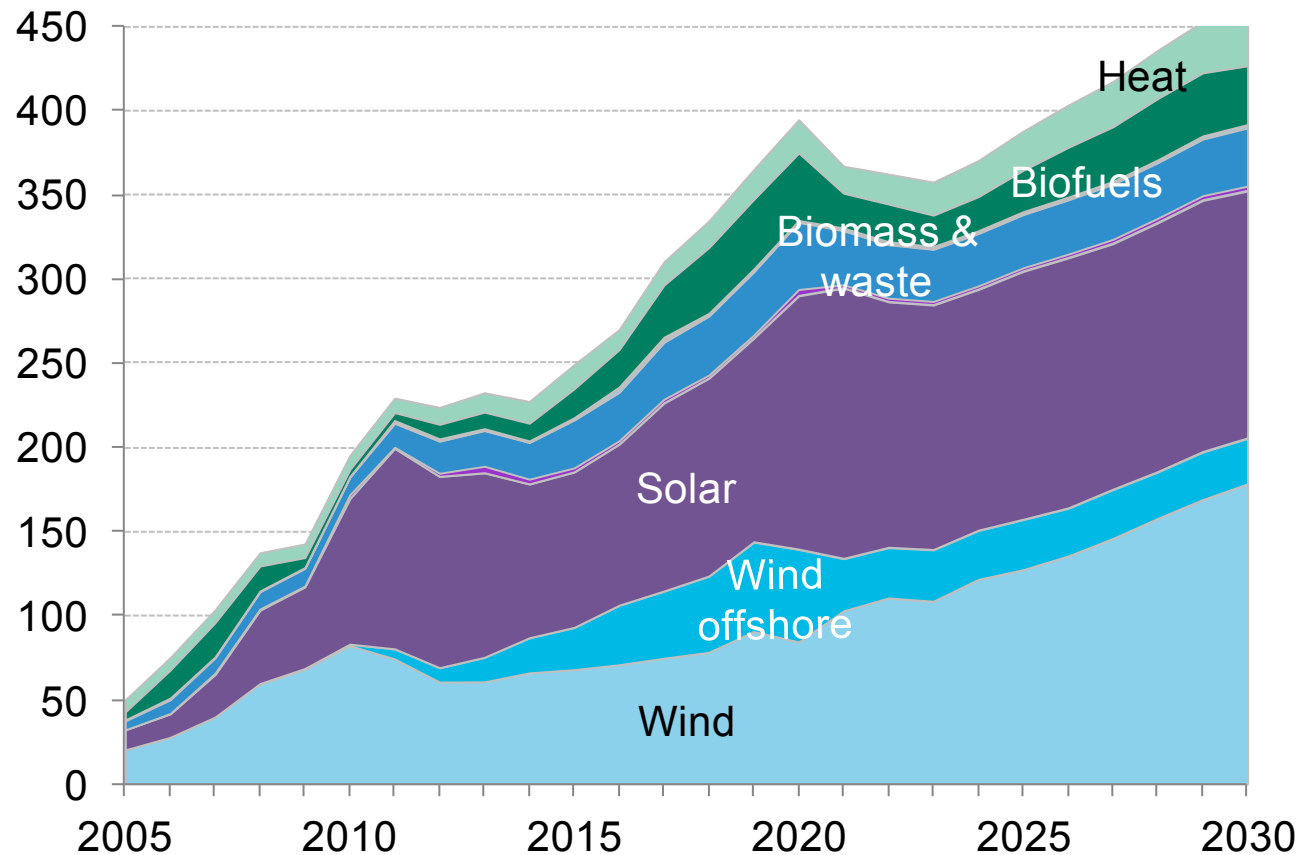
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Source: Bloomberg New Energy Finance

ANNUAL VALUE OF RENEWABLE ENERGY CAPACITY INSTALLED BY TECHNOLOGY SECTOR, 2005-30 (\$BN)

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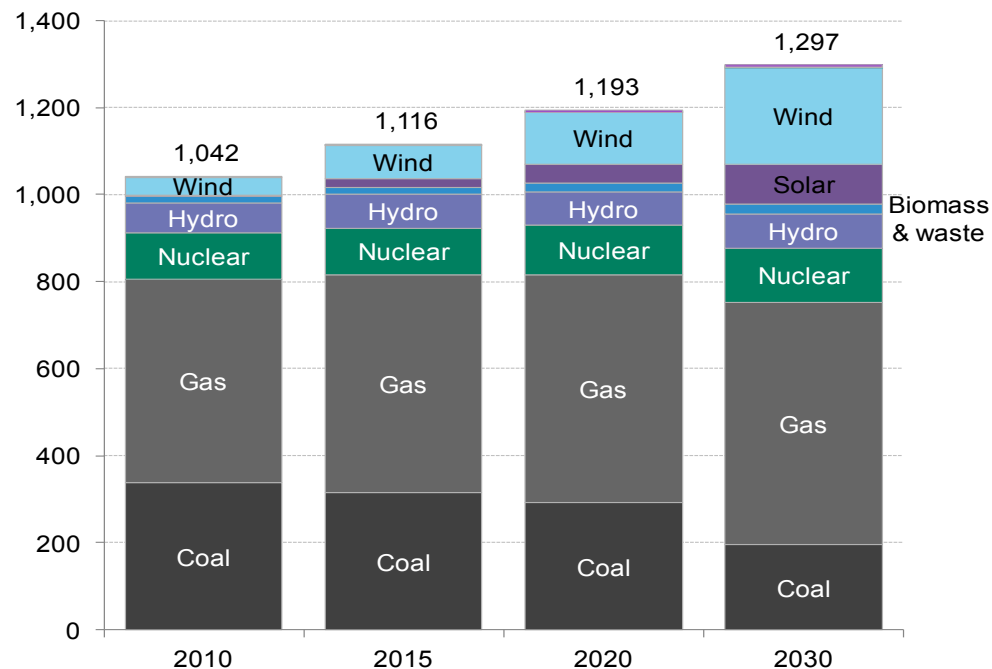


Source: Bloomberg New Energy Finance

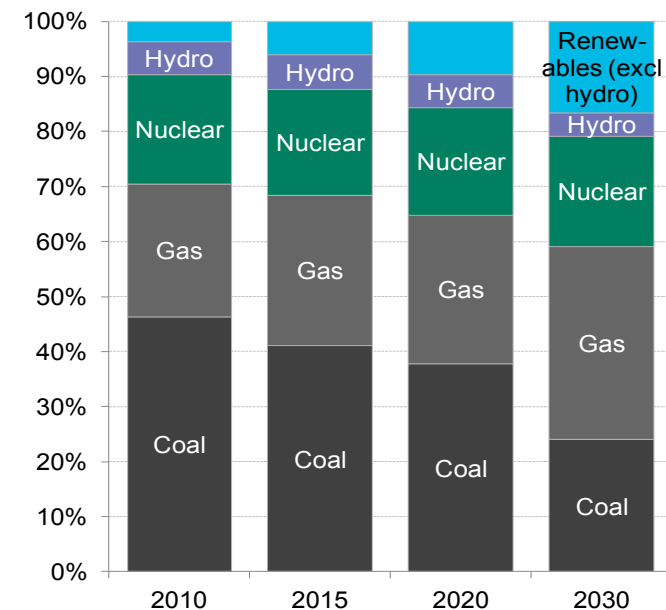
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UNITED STATES POWER GENERATION MIX 2010-2030

TOTAL INSTALLED CAPACITY BY TECHNOLOGY (GWTH)



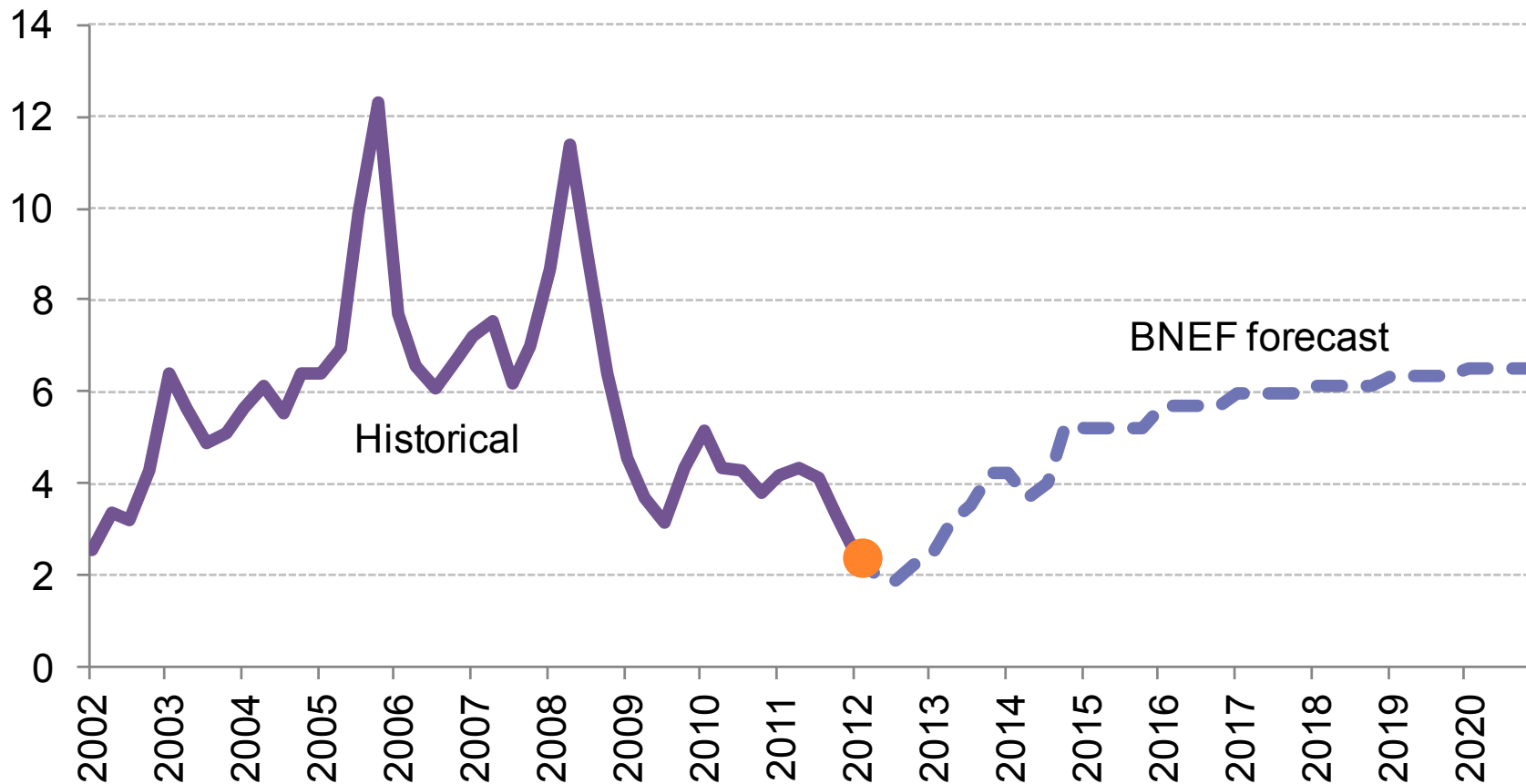
EU-27 POWER GENERATION FUEL MIX (%)



Source: Bloomberg New Energy Finance

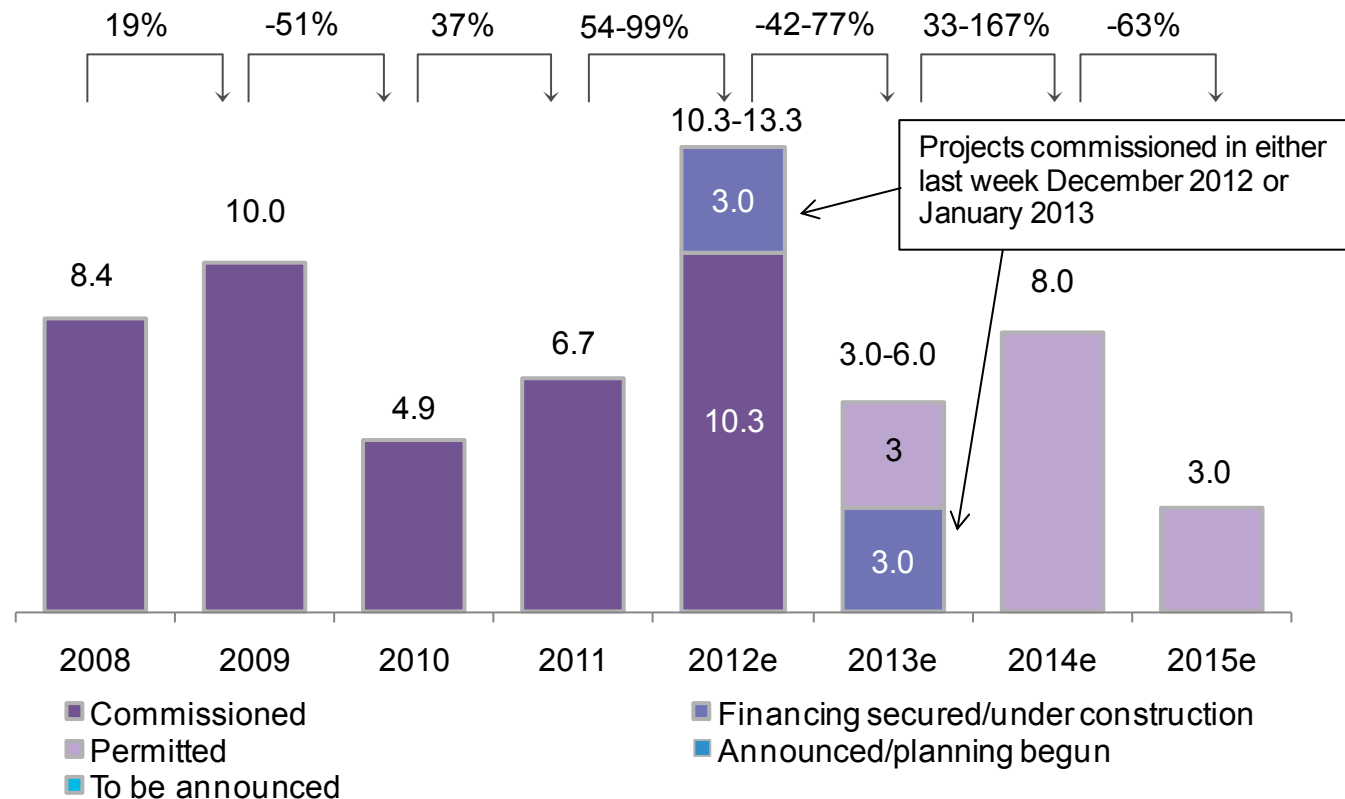
THE ELEPHANT IN THE ROOM

Henry Hub gas prices (\$/MMBtu)



Source: Bloomberg New Energy Finance

US WIND INSTALLATIONS FORECAST 2013-2015E (GW; % ANNUAL GROWTH)



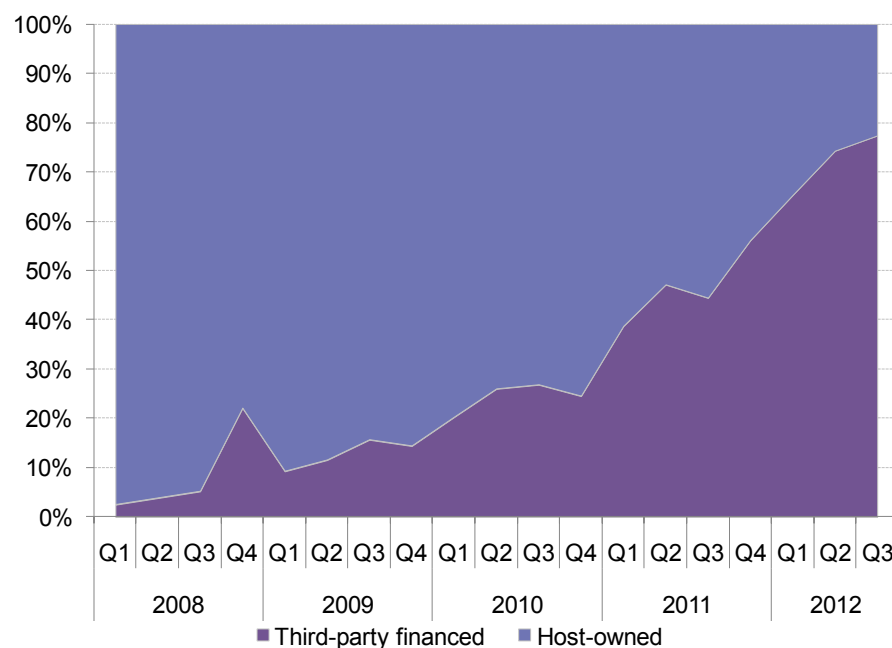
Source: Bloomberg New Energy Finance

SOLAR INSTALLATIONS PER QUARTER BY OWNERSHIP

Q1 2008 – Q3 2012 (% SHARE)

RESIDENTIAL MARKET

COMMERCIAL-SCALE MARKET



Note: 'Residential' is defined as systems 10kW or less and where 'host-owner sector' is labelled 'residential' in the CSI dataset. 'Commercial-scale' is based on the 'host-customer' label in the CSI dataset. "Commercial-scale" covers only systems between 10kW and 1,000kW DC.

Source: Bloomberg New Energy Finance, California Solar Initiative.

THIRD-PARTY TAX EQUITY PROVIDERS FOR US RENEWABLES

Pre-financial crisis



Post-financial crisis

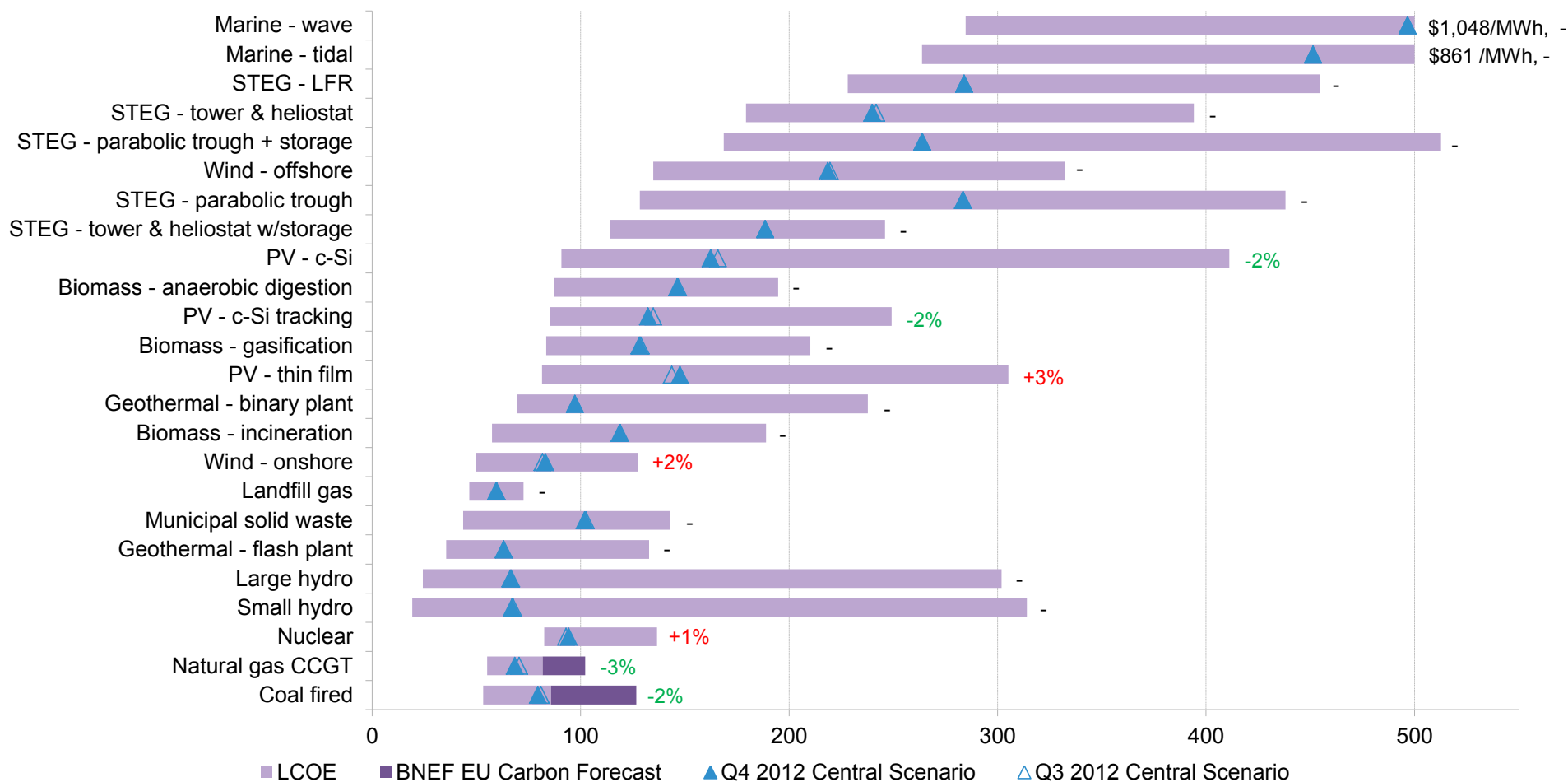


Today



Source: Bloomberg New Energy Finance, US PREF

LEVELISED COST OF ELECTRICITY Q4 2012 (\$/MWh)



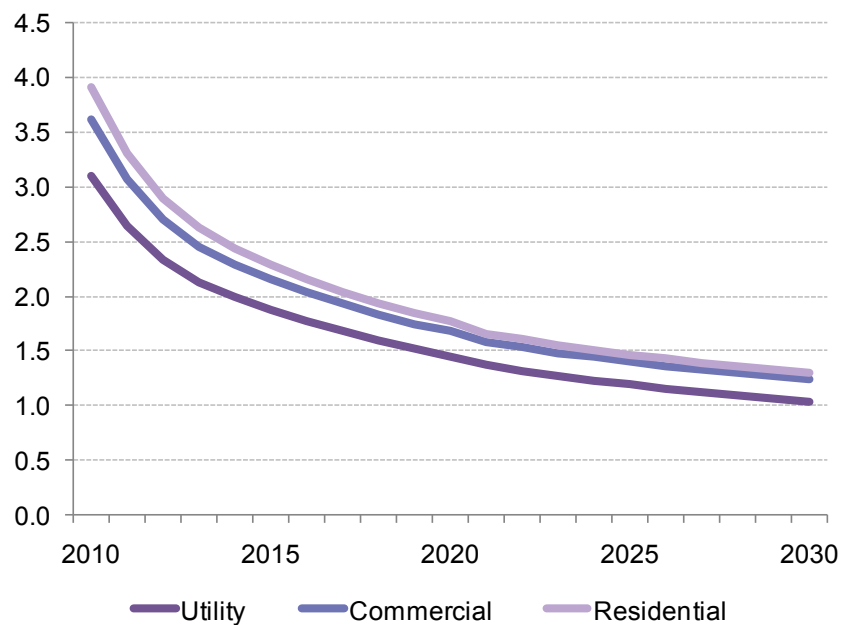
Source: Bloomberg New Energy Finance. Note: Carbon forecasts from the Bloomberg New Energy Finance European Carbon Model with an average price to 2030 of \$38/mt. Coal and natural gas prices from the US EIA and BNEF. Percentage change represents change from Q3 2012

Source: Bloomberg New Energy Finance

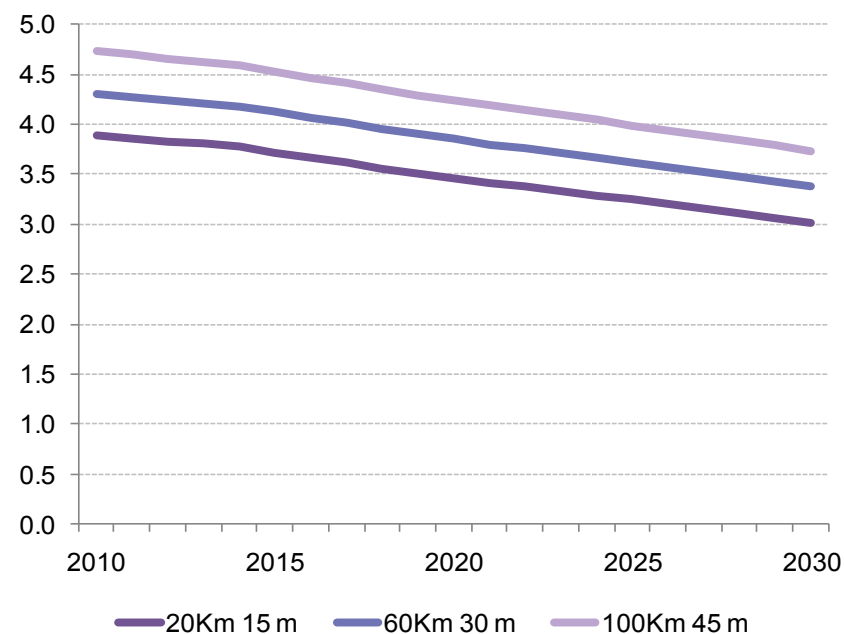
EXPERIENCE CURVES

2011-30 (REAL 2010 \$/W)

SOLAR PHOTOVOLTAIC



OFFSHORE WIND

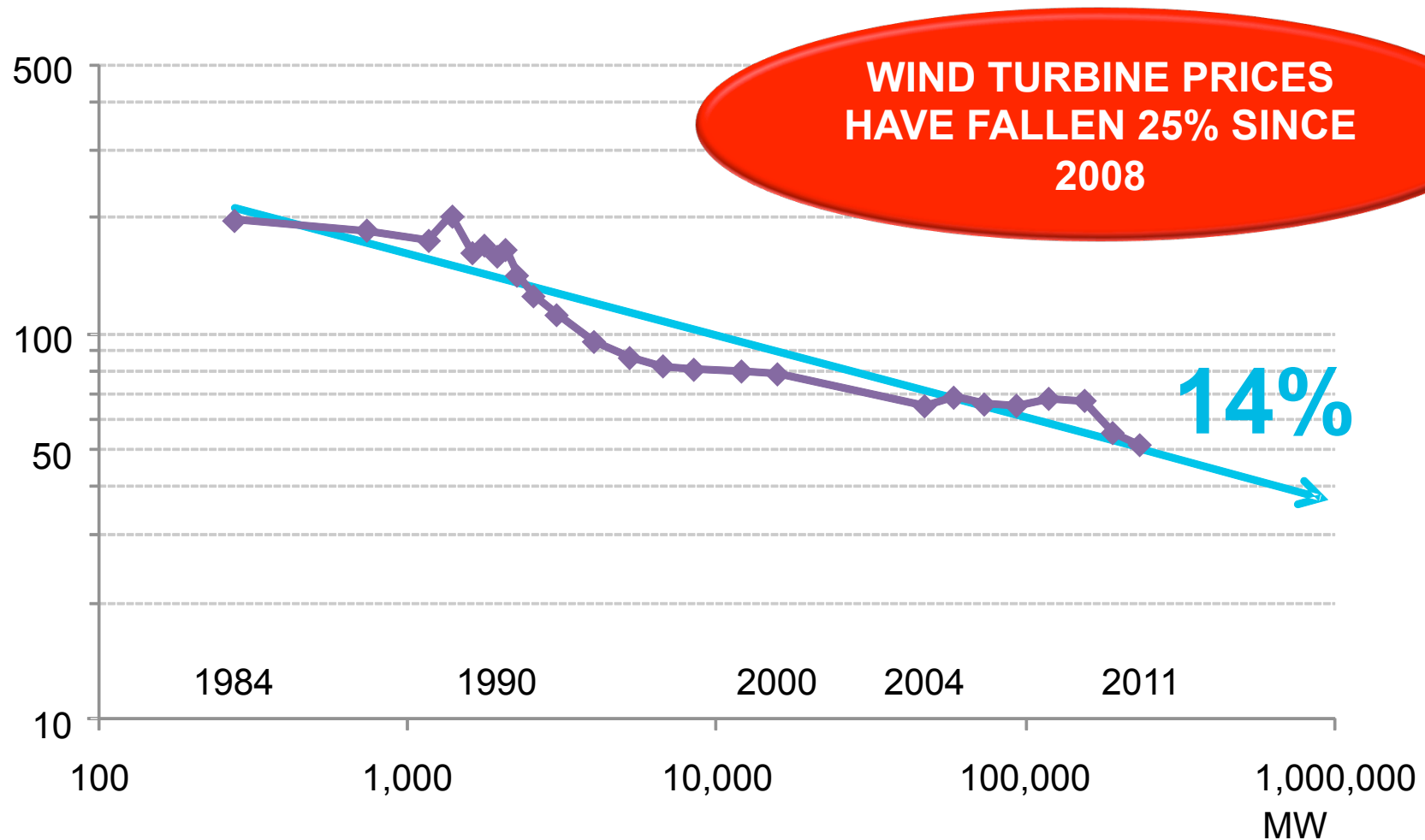


Note: The first number is distance from shore and second number depth

Source: Bloomberg New Energy Finance

AVERAGE LEVELIZED COST OF ONSHORE WIND

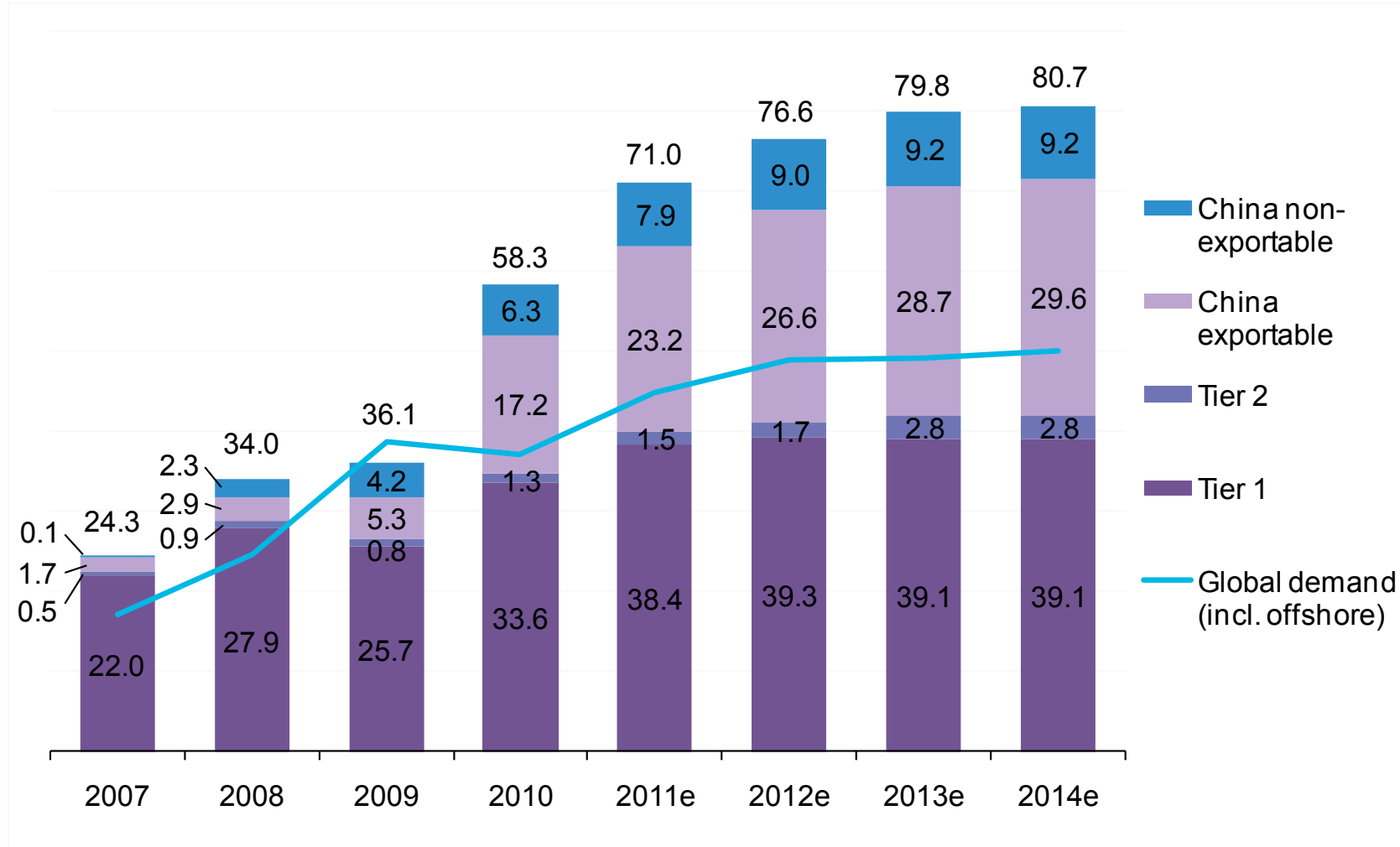
1984-2011 (€/MWH)



Note: Learning curve (blue line) is least square regression: $R^2 = 0.88$ and 14% learning rate.

Source: Bloomberg New Energy Finance, ExTool

GLOBAL WIND TURBINE SUPPLY AND DEMAND 2007-2014 E (GW)

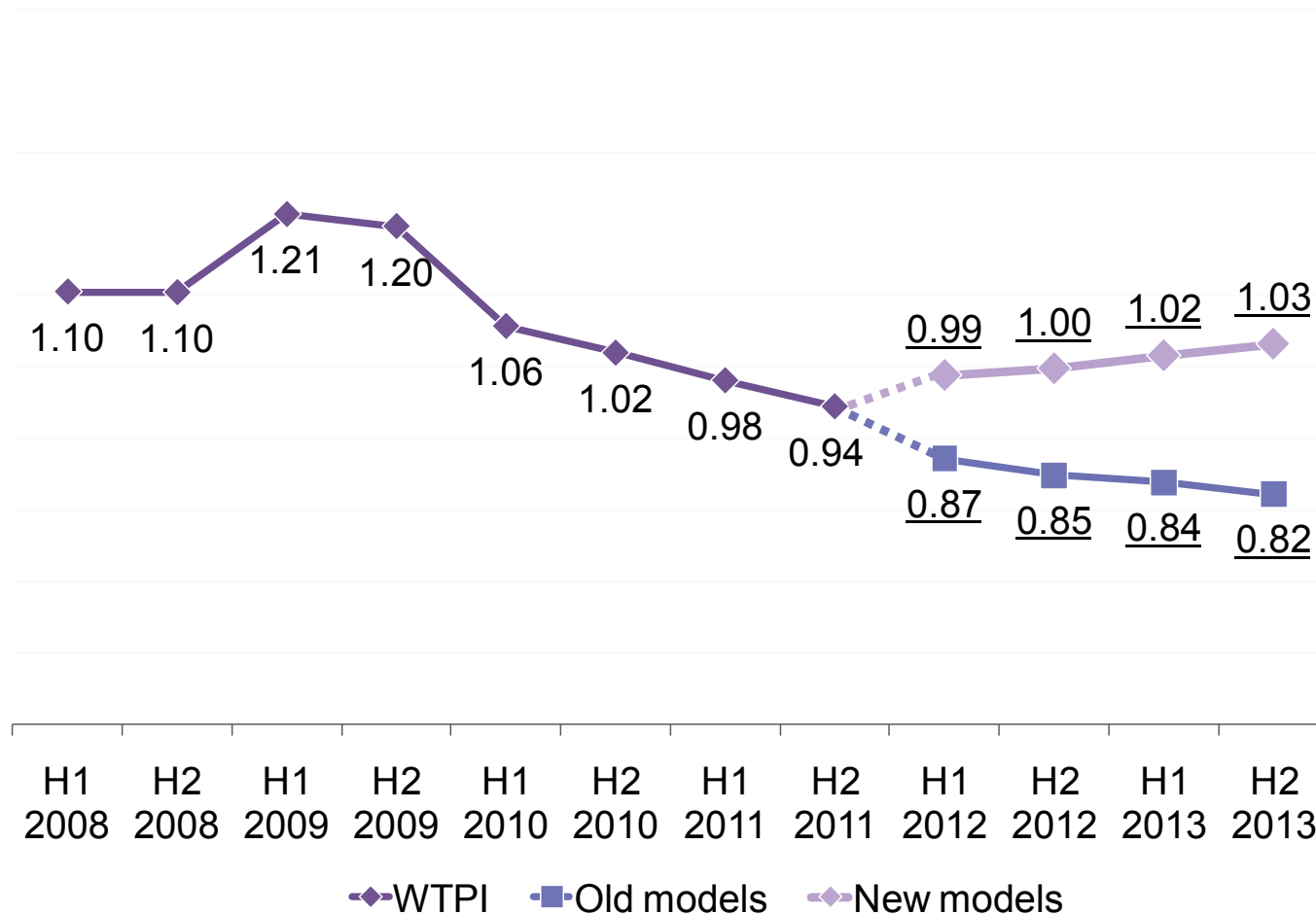


Notes: Effective supply models the actual amount of turbines available for projects after discounts to nominal manufacturing capacity.

Source: Bloomberg New Energy Finance

BNEF WIND TURBINE PRICE INDEX

BY TYPE OF TURBINE AND DATE OF DELIVERY, H1 2008–H2 2013 (€/MW)



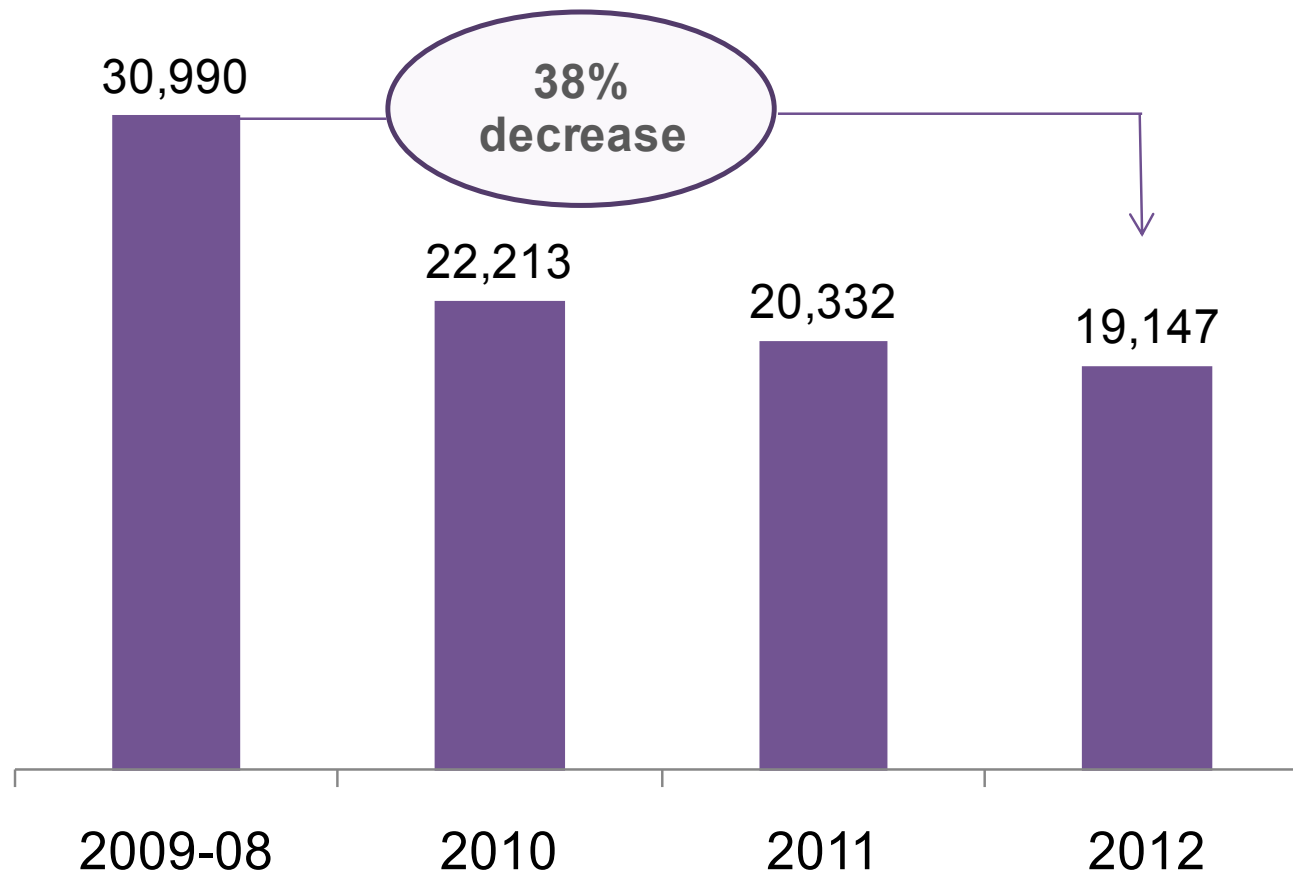
Note: Mean prices for contracts including turbine, towers and transport to site. VAT and installation costs are excluded. This Index excludes turbine contracts sold and delivered in China, which are significantly lower in pricing.

Source: Bloomberg New Energy Finance

AVERAGE PRICE FOR FULL-SERVICE O&M CONTRACTS

2008-12 (EUR/MW PER YEAR)

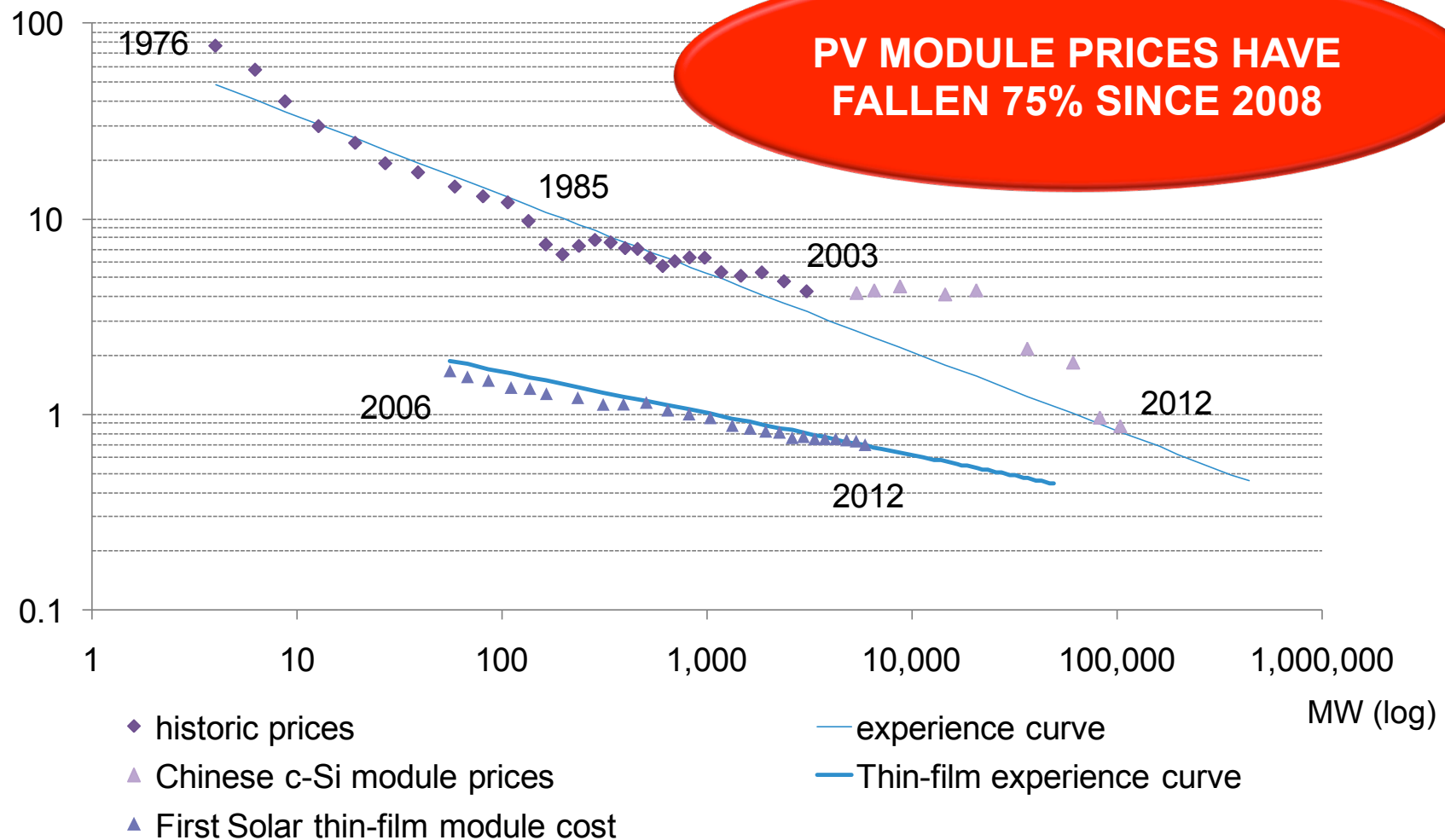
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Source: Bloomberg

PV MODULE PRICES, 1976–2012

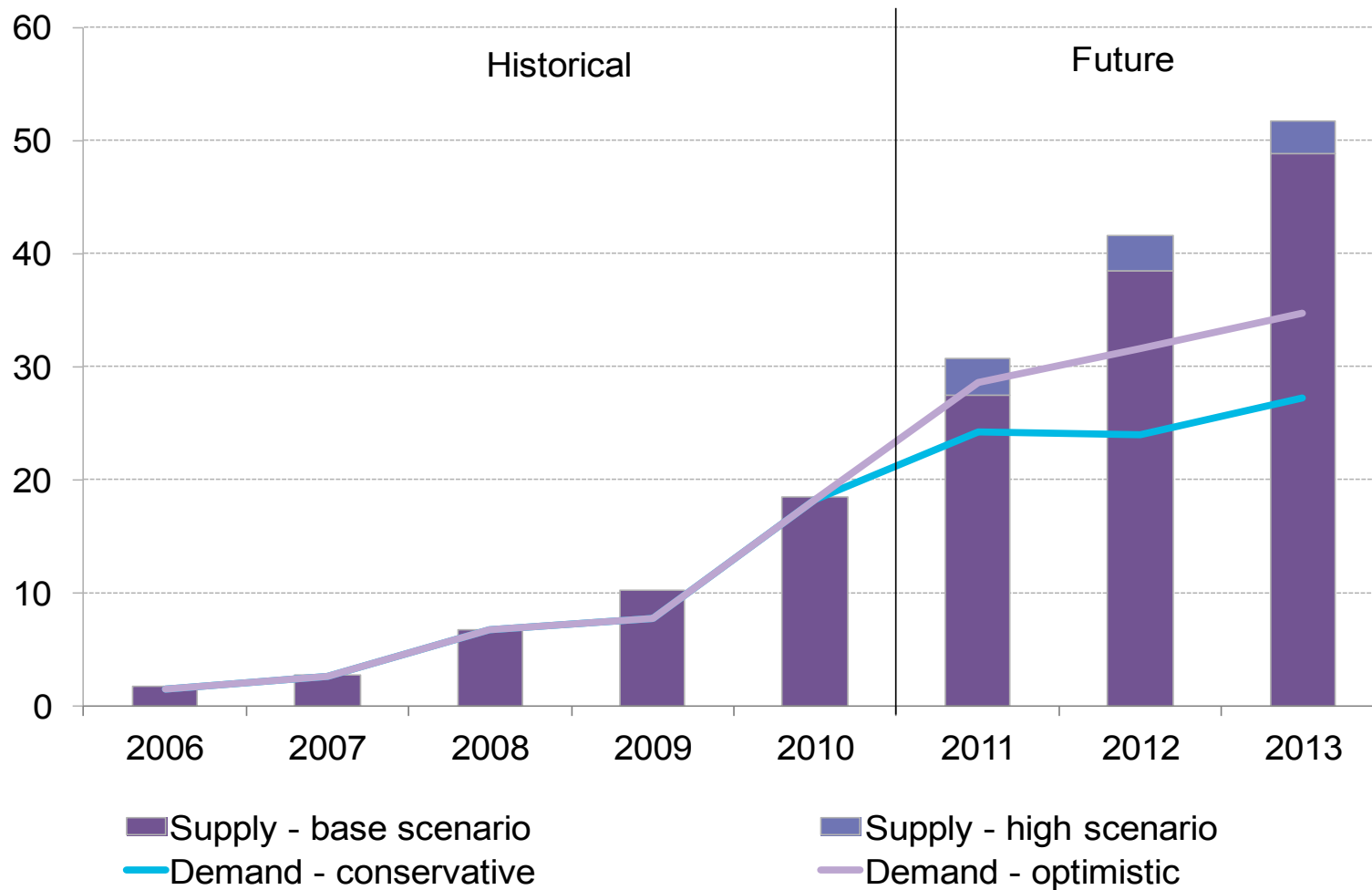
(\$/W)



Notes: Inflation adjustment using US PPI, R2 of c-Si regression = 0.94, R2 of FSLR regression = 0.98; data since 2007 based on Bloomberg New Energy Finance Solar Spot Market Price Index

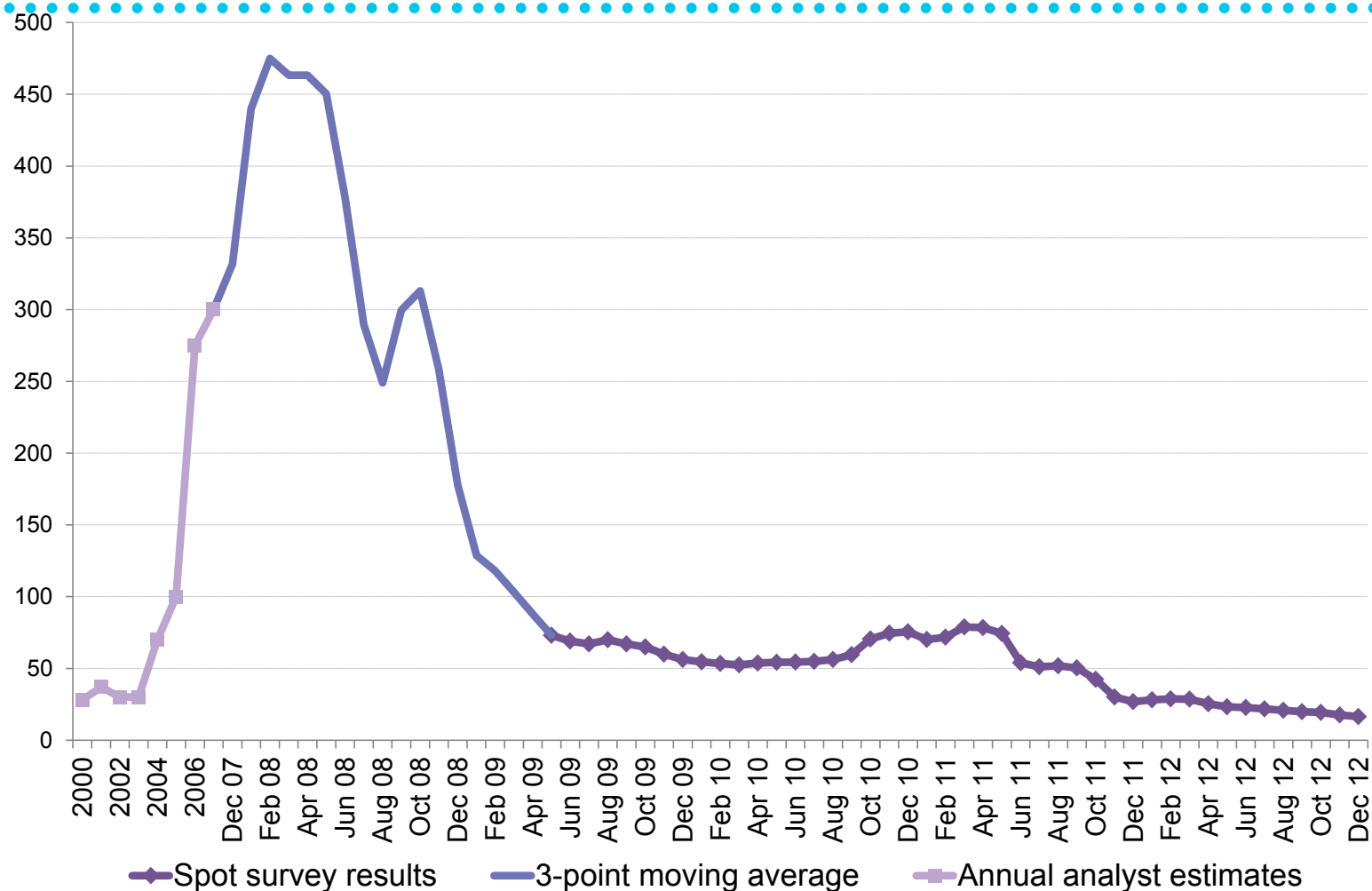
Source: Paul Maycock, Bloomberg New Energy Finance, FSLR filings

GLOBAL PV MODULE SUPPLY AND DEMAND 2007-2013 (GW)



Source: Bloomberg New Energy Finance

SPOT PRICES OF SOLAR-GRADE SILICON, YEAR 2000 – DECEMBER 2012 (\$/KG)

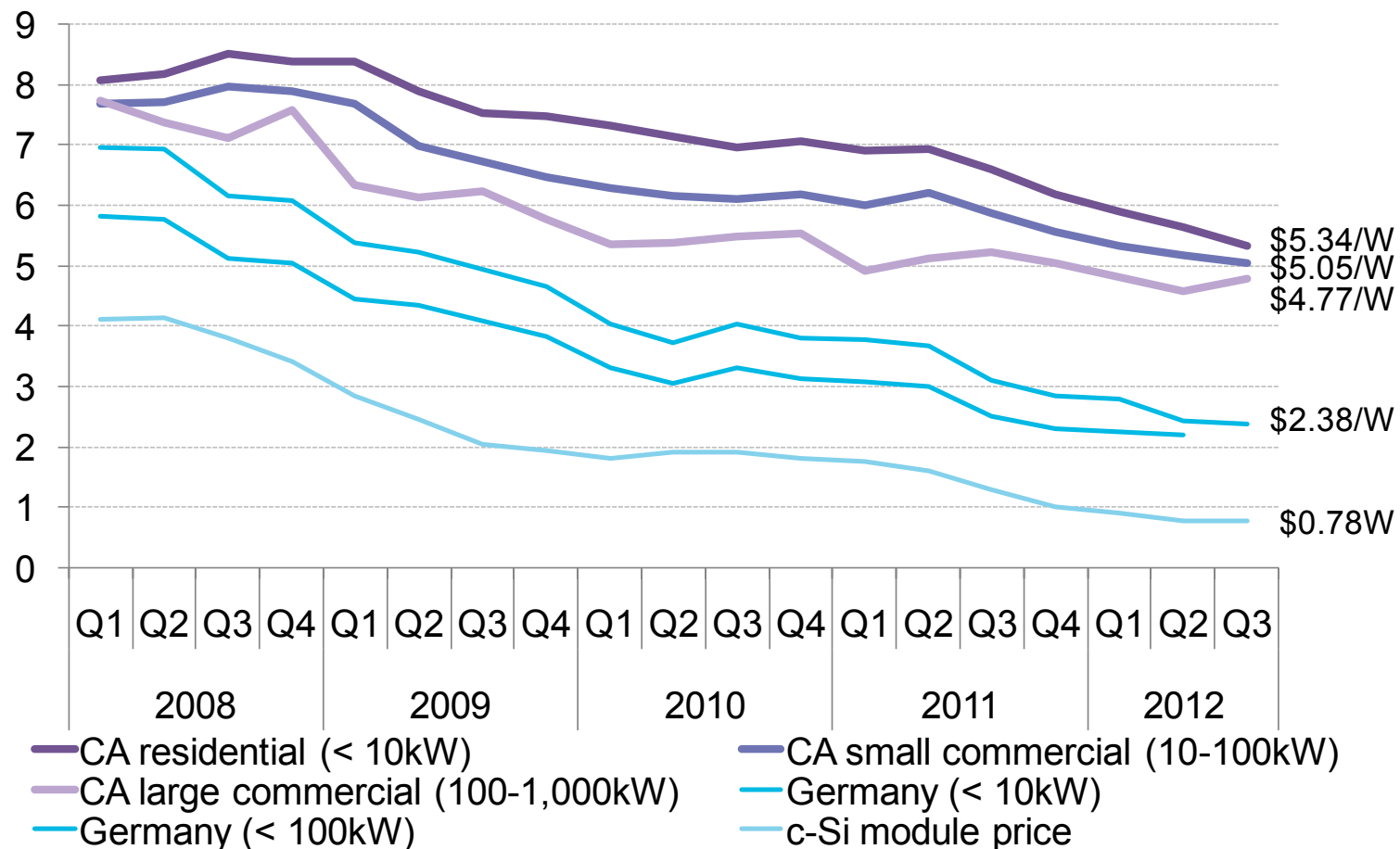


Note: Annual data 2000-07 from various industry sources. Data November 2007–May 2009 based on a 3-point moving average of actual spot deals. Consistent monthly data collection using the Spot Price Index began in May 2009.

Source: Bloomberg New Energy Finance

AVERAGE SYSTEM PRICES BY REGION, SYSTEM SIZE

Q1 2008 – Q3 2012

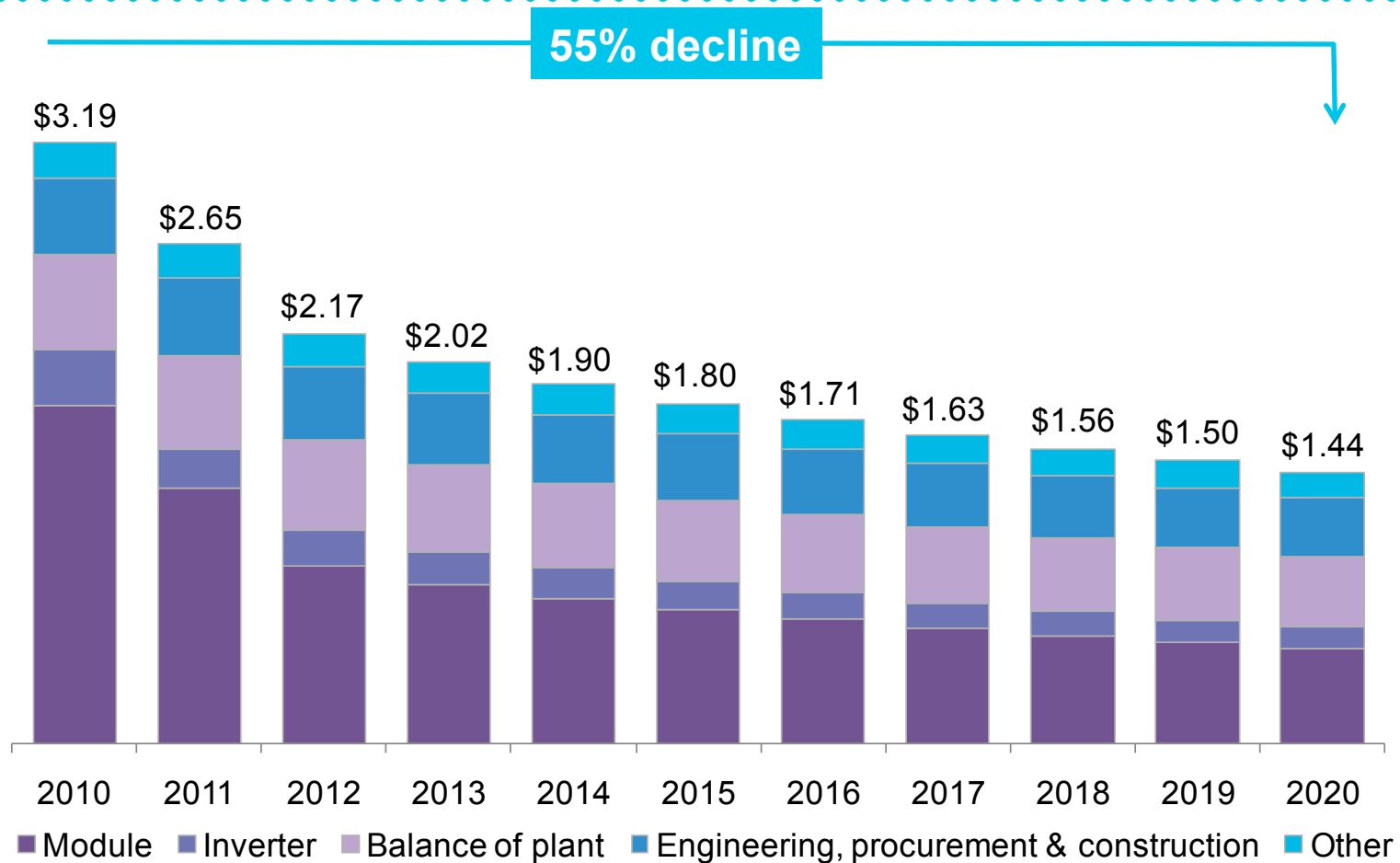


Note: California prices are dated by application date, while Germany is by installation date. German prices exclude VAT. As of Q3 2012, the BSW ceased publishing prices for systems <100kW. The inclusion of US sales taxes is not consistent in CSI reporting. All California prices are calculated by weighted average.

Source: Bloomberg New Energy Finance, BSW Solar, California Solar Initiative

FORECAST LARGE PV PROJECT CAPITAL COST, 2010–20

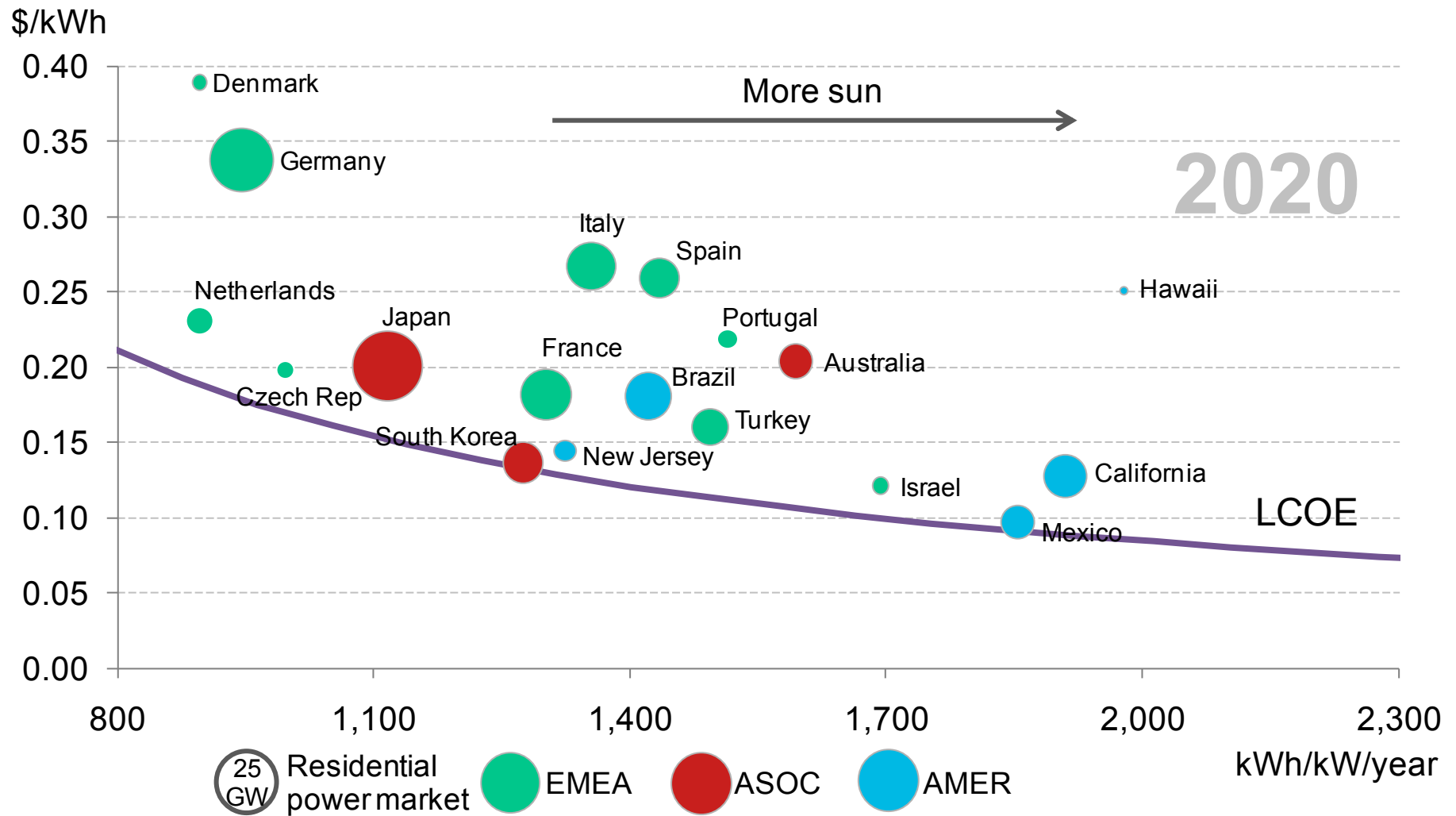
(\$/W)



Note: Based on historical experience curves for crystalline silicon modules and other components, and the prices in the mature German market. 2010 dollars. Assumes Bloomberg New Energy Finance short-term build forecasts to 2014, 20% new build growth after that.

Source: Bloomberg New Energy Finance

RESIDENTIAL PV PRICE PARITY



Note: LCOE based on 6% weighted average cost of capital, 0.7%/year module degradation, 1% capex as O&M annually.

Source: Eurostat, grid operators, Bloomberg New Energy Finance

SOUTHERN COMPANY'S BELLWETHER SOLAR INITIATIVE



- Second-largest utility in the US
- Service area covers four Deep South states, no RPS
- Opponent of renewables legislation at federal level



30MW Cimarron I solar project
(northern New Mexico)

- Acquired ~100MW of PV assets since March 2010, via JVs with Ted Turner
- Georgia Power (Southern subsidiary) filed initiative to conduct 210 MW *voluntary* solar solicitation

• Trend 1: Solar will become a cost-competitive option

• Trend 2: RPS policies will decline in importance

• Trend 3: Utilities will eye solar for defensive reasons

• Trend 4: Utilities (low WACC) will become asset owners

• Trend 5: Utilities will become a source of tax equity

Source: Bloomberg New Energy Finance, Solar Daily, Southern Company

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Carbon Capture & Storage

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Water

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